

# NTP4302, NTB4302

## Power MOSFET 74 Amps, 30 Volts N-Channel TO-220 and D<sup>2</sup>PAK

### Features

- Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- $I_{DSS}$  Specified at Elevated Temperature

### Typical Applications

- DC-DC Converters
- Low Voltage Motor Control
- Power Management in Portable and Battery Powered Products: I.e: Computers, Printers, Cellular and Cordless Telephones, and PCMCIA Cards

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	30	Vdc
Drain-to-Gate Voltage ( $R_{GS} = 10\text{ M}\Omega$ )	$V_{DGR}$	30	Vdc
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	Vdc
Drain Current			
– Continuous @ $T_C = 25^\circ\text{C}$	$I_D$	74	Adc
– Continuous @ $T_C = 100^\circ\text{C}$	$I_D$	47	
– Single Pulse ( $t_p \leq 10\text{ }\mu\text{s}$ )	$I_{DM}$	175	Apk
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	80 0.66	W W/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	$-55$ to $+150$	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 30\text{ Vdc}$ , $V_{GS} = 10\text{ Vdc}$ , $L = 5.0\text{ mH}$ $I_{L(pk)} = 17\text{ A}$ , $V_{DS} = 30\text{ Vdc}$ , $R_G = 25\text{ }\Omega$ )	$E_{AS}$	722	mJ
Thermal Resistance			$^\circ\text{C/W}$
– Junction-to-Case	$R_{\theta JC}$	1.55	
– Junction-to-Ambient (Note 1)	$R_{\theta JA}$	70	
Maximum Lead Temperature for Soldering Purposes, $1/8"$ from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

1. When surface mounted to an FR4 Board using minimum recommended Pad Size, (Cu Area  $0.412\text{ in}^2$ ).
2. Current limited by internal lead wires.

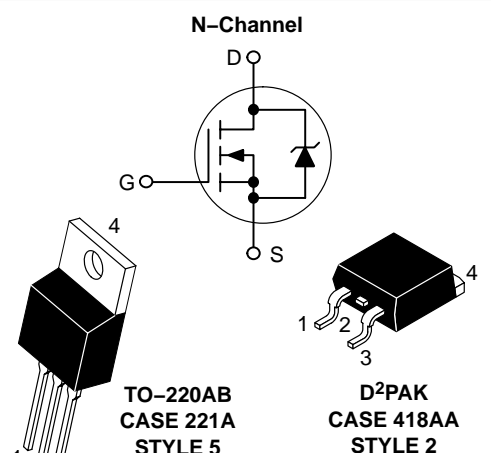


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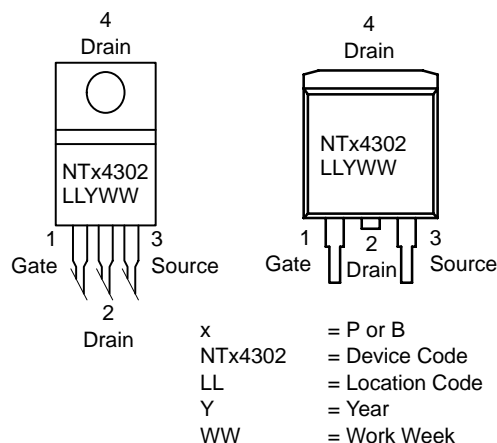
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**74 AMPERES  
30 VOLTS**

**$R_{DS(on)} = 9.3\text{ m}\Omega$  Max**



### MARKING DIAGRAMS & PIN ASSIGNMENTS



### ORDERING INFORMATION

Device	Package	Shipping
NTP4302	TO-220AB	50 Units/Rail
NTB4302	D <sup>2</sup> PAK	50 Units/Rail
NTB4302T4	D <sup>2</sup> PAK	800/Tape & Reel

# NTP4302, NTB4302

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	30 –	– 25	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 30 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 30 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	– –	– –	1.0 10	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	–	–	±100	nAdc

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc) Threshold Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	1.0 –	1.9 –3.8	3.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 37 Adc) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 10 Adc)	R <sub>DS(on)</sub>	–	6.8 6.8 9.5	9.3 9.3 12.5	mΩ
Forward Transconductance (Note 3) (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc)	g <sub>FS</sub>	–	40	–	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 24 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	2050	2400	pF
Output Capacitance		C <sub>oss</sub>	–	640	800	
Transfer Capacitance		C <sub>rss</sub>	–	225	310	

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V <sub>DD</sub> = 24 Vdc, I <sub>D</sub> = 20 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 2.5 Ω) (Note 3)	t <sub>d(on)</sub>	–	10	18	ns
Rise Time		t <sub>r</sub>	–	22	35	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	45	75	
Fall Time		t <sub>f</sub>	–	35	70	
Turn-On Delay Time	(V <sub>DD</sub> = 24 Vdc, I <sub>D</sub> = 10 Adc, V <sub>GS</sub> = 4.5 Vdc, R <sub>G</sub> = 2.5 Ω) (Note 3)	t <sub>d(on)</sub>	–	18	–	ns
Rise Time		t <sub>r</sub>	–	70	–	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	32	–	
Fall Time		t <sub>f</sub>	–	30	–	
Gate Charge	(V <sub>DS</sub> = 24 Vdc, I <sub>D</sub> = 37 Adc, V <sub>GS</sub> = 4.5 Vdc) (Note 3)	Q <sub>T</sub>	–	28	–	nC
		Q <sub>gs</sub>	–	7.5	–	
		Q <sub>gd</sub>	–	19	–	

### SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc) (Note 3) (I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	– –	0.90 0.75	1.3 –	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs) (Note 3)	t <sub>rr</sub>	–	37	–	ns
		t <sub>a</sub>	–	21	–	
		t <sub>b</sub>	–	16	–	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	–	0.035	–	μC

- Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
- Switching characteristics are independent of operating junction temperatures.

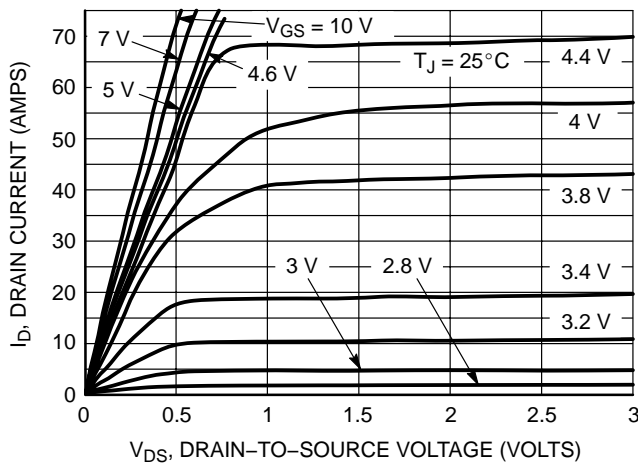


Figure 1. On-Region Characteristics

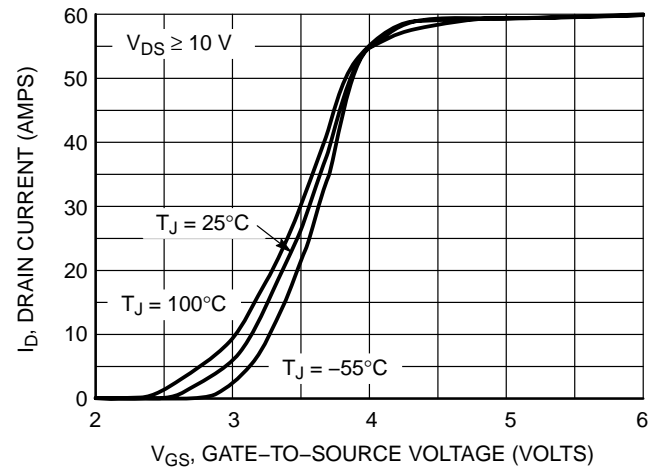


Figure 2. Transfer Characteristics

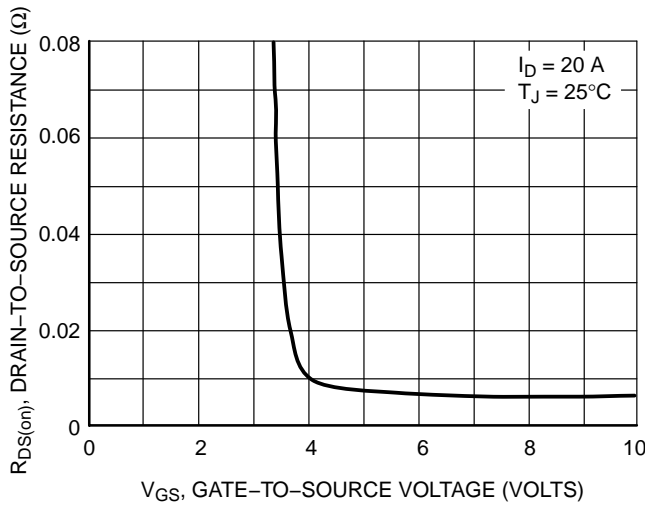


Figure 3. On-Resistance versus Gate-to-Source Voltage

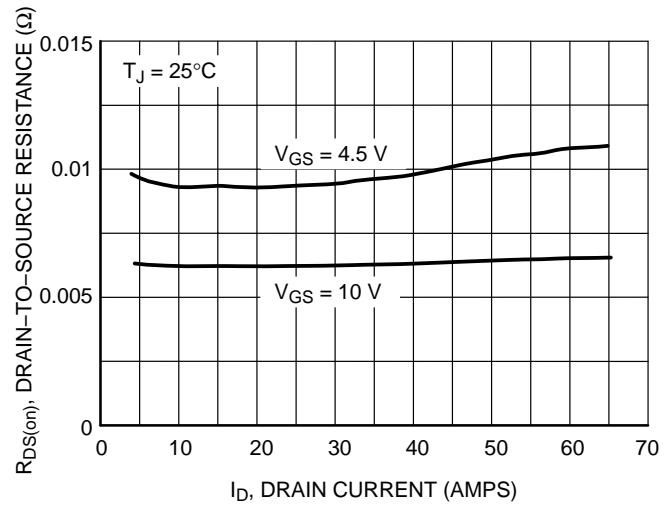


Figure 4. On-Resistance versus Drain Current and Gate Voltage

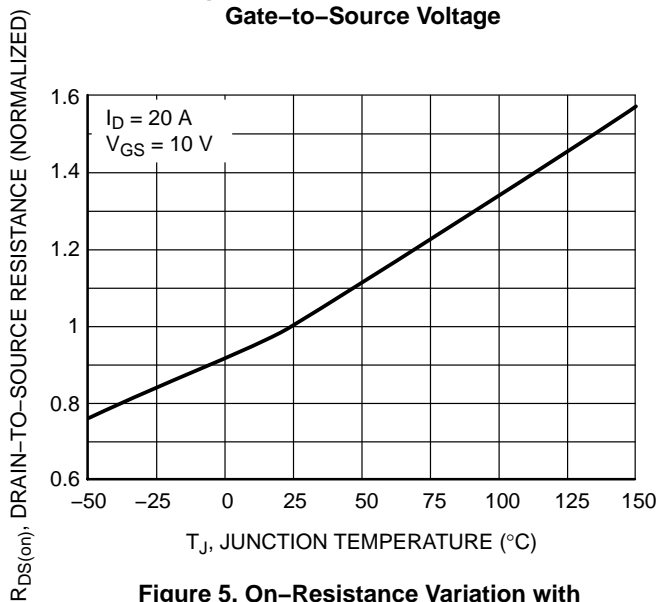


Figure 5. On-Resistance Variation with Temperature

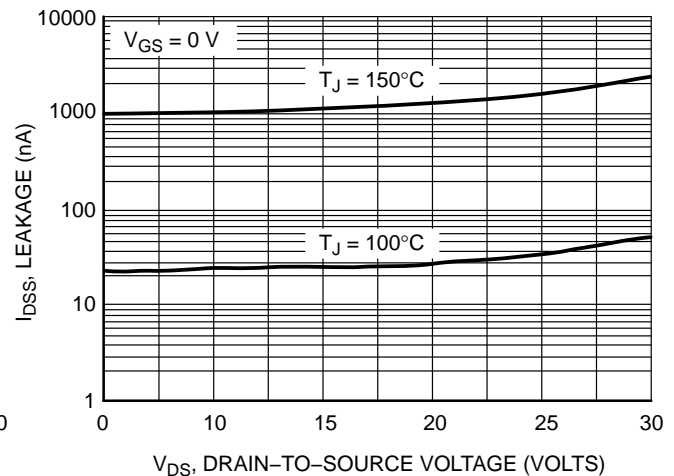


Figure 6. Drain-to-Source Leakage Current versus Voltage

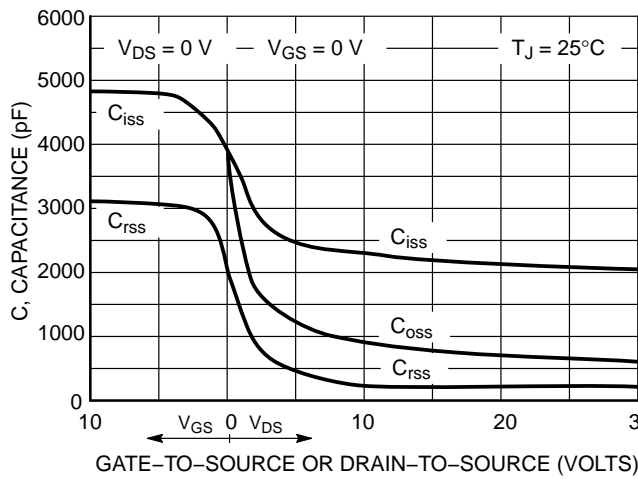


Figure 7. Capacitance Variation

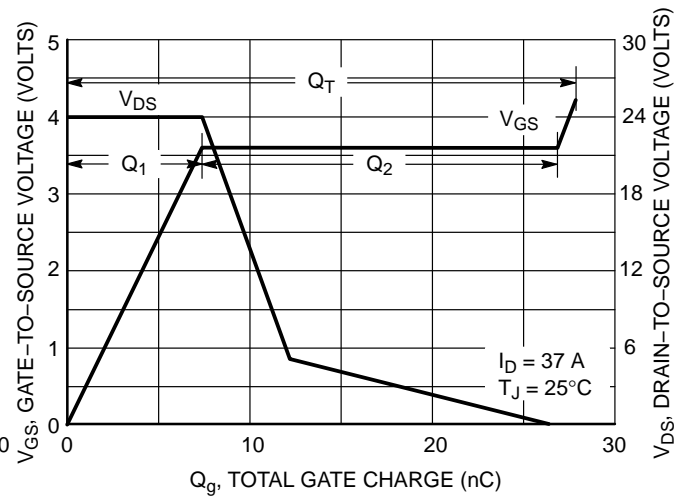


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

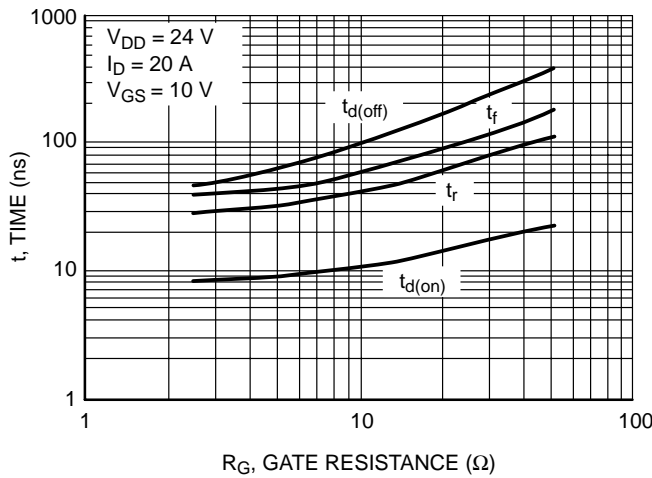


Figure 9. Resistive Switching Time Variations versus Gate Resistance

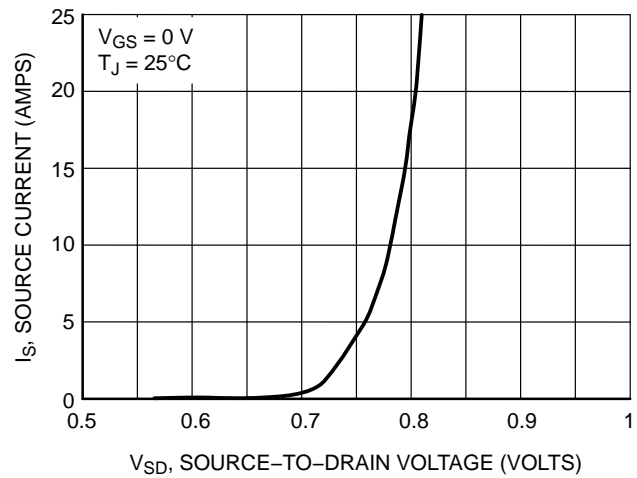


Figure 10. Diode Forward Voltage versus Current

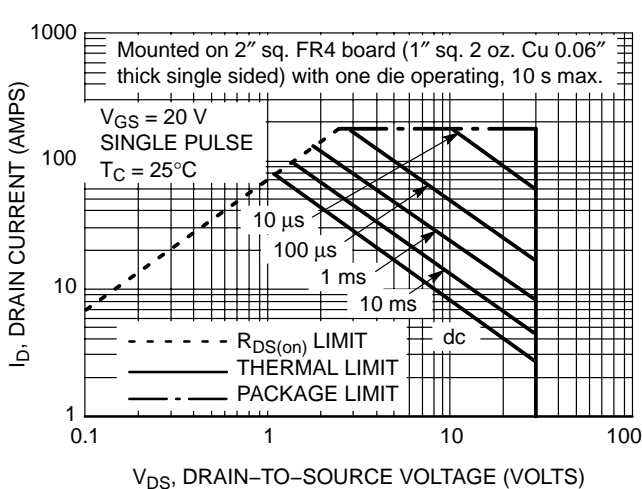


Figure 11. Maximum Rated Forward Biased Safe Operating Area

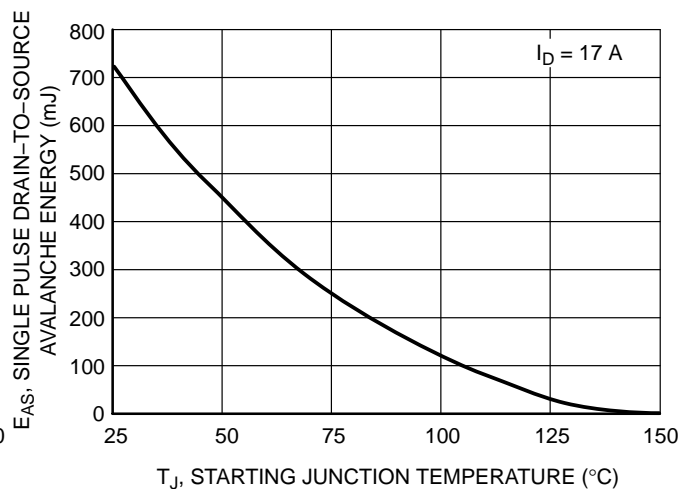


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

SAFE OPERATING AREA

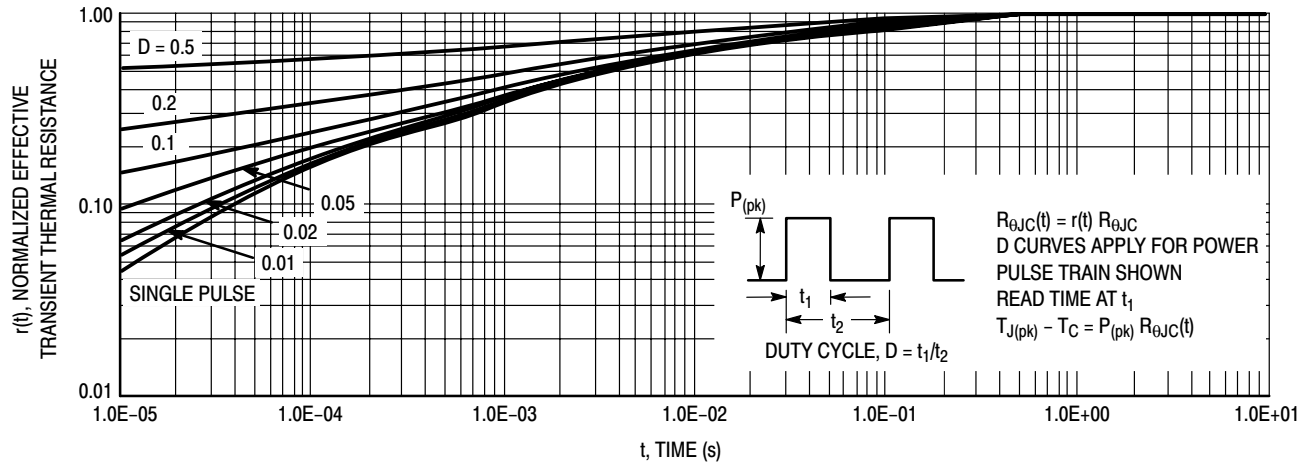


Figure 13. Thermal Response

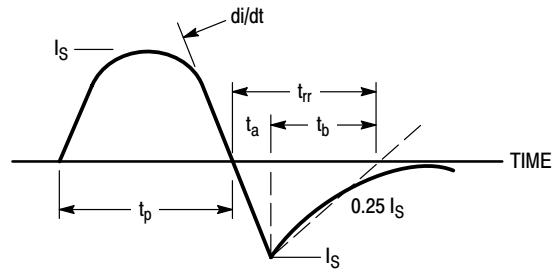
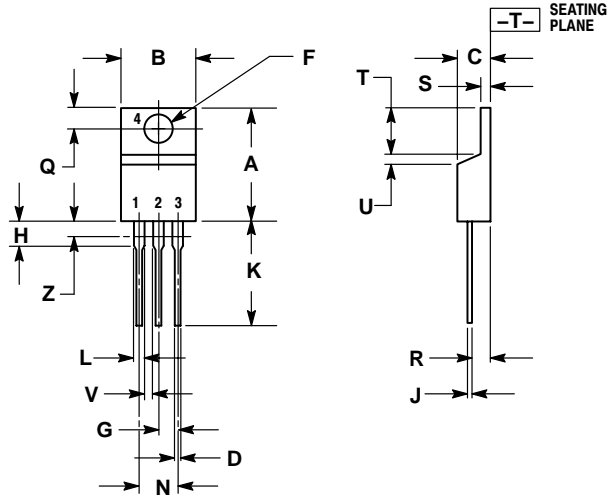


Figure 14. Diode Reverse Recovery Waveform

# NTP4302, NTB4302

## PACKAGE DIMENSIONS

TO-220 THREE-LEAD  
TO-220AB  
CASE 221A-09  
ISSUE AA



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

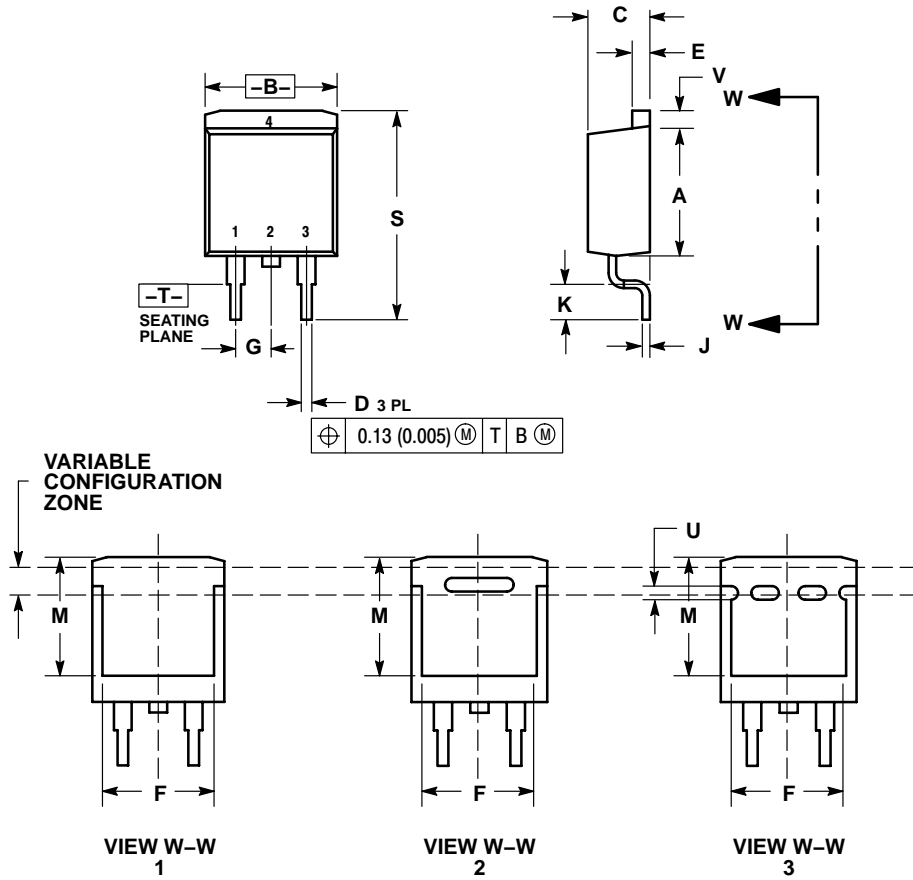
### STYLE 5:

- PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

# NTP4302, NTB4302

## PACKAGE DIMENSIONS

D<sup>2</sup>PAK  
CASE 418AA-01  
ISSUE O




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.036	0.51	0.92
E	0.045	0.055	1.14	1.40
F	0.310	---	7.87	---
G	0.100 BSC		2.54 BSC	
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
M	0.280	---	7.11	---
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

- STYLE 2:
- PIN 1. GATE
  - PIN 2. DRAIN
  - PIN 3. SOURCE
  - PIN 4. DRAIN

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